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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/522,604

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Masahiro Harada

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EXAMINER

YOUNG, NATASHA E

ART UNIT

PAPER NUMBER

1797

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DELIVERY MODE

08/31/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/522,604	<b>Applicant(s)</b> HARADA ET AL.	
	<b>Examiner</b> NATASHA YOUNG	<b>Art Unit</b> 1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 July 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☐ Claim(s) 1,4,5 and 8-10 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,4,5 and 8-10 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 24, 2009 has been entered.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

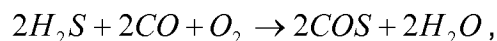
The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 4, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Herrington et al (US 4,618,723) in view of Tung et al (US 2003/0027912 A1)

Regarding claim 1, Herrington et al discloses a COS treatment apparatus for a gasified gas containing COS, H<sub>2</sub>S, H<sub>2</sub>O, O<sub>2</sub>, and CO, which comprises: a first reactor into which the gasified gas is to be introduced, the first reactor being configured to increase an initial concentration of COS in the gas and decrease concentration of H<sub>2</sub>S, CO, and O<sub>2</sub> in the gas at a gas temperature of at least 300°C; a second reactor located at a downstream side of a gasified gas flow with respect to the first reactor, the second reactor being configured to decrease the increased concentration of COS in the gas passed through the first reactor to a concentration lower than the initial concentration of COS in the gas, wherein the first reactor comprises an O<sub>2</sub> removal catalyst for accelerating the following reaction:



the O<sub>2</sub> removal catalyst comprising of TiO<sub>2</sub> and Cr<sub>2</sub>O<sub>3</sub> or comprising of TiO<sub>2</sub> and NiO (see column 3, line 26 through column 4, line 45 and figure 1) which discloses a catalyst which is typically an oxide of a Group 8 metal and a support which can be titanium oxide.

Herrington et al does not disclose the O<sub>2</sub> removal catalyst consisting of TiO<sub>2</sub> and Cr<sub>2</sub>O<sub>3</sub> or consisting of TiO<sub>2</sub> and NiO.

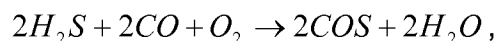
Tung et al disclose that TiO<sub>2</sub>, Cr<sub>2</sub>O<sub>3</sub>, and NiO an oxygen-scavenging elements (see paragraph 0029).

It would have been obvious to choose the O<sub>2</sub> removal catalyst consisting of TiO<sub>2</sub> and Cr<sub>2</sub>O<sub>3</sub> or consisting of TiO<sub>2</sub> and NiO from a finite number of identified, predictable solutions for oxygen removal catalyst (or oxygen-scavenging elements, i.e., to would have been "obvious to try" the specific structure of the O<sub>2</sub> removal catalyst consisting of TiO<sub>2</sub> and Cr<sub>2</sub>O<sub>3</sub> or consisting of TiO<sub>2</sub> and NiO to enhance reaction with molecular oxygen.

Regarding claim 4, Herrington et al discloses a COS treatment apparatus wherein said O<sub>2</sub> removal catalyst is located in a higher-temperature region with respect to said COS conversion catalyst (see column 3, line 26 through column 4, line 9).

Regarding claim 9, Herrington et al discloses a COS treatment apparatus for a gasified gas containing COS, H<sub>2</sub>S, H<sub>2</sub>O, O<sub>2</sub>, and CO, comprising: a reactor into which the gasified gas is to be introduced, the reactor being configured to convert COS to H<sub>2</sub>S in the presence of O<sub>2</sub>, the reactor comprising a TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub>, wherein

TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> is an O<sub>2</sub> removal catalyst for accelerating the following reaction:



wherein the TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> is a COS conversion catalyst (see column 3, line 26 through column 4, line 45 and figure 1).

Herrington et al does not disclose the reactor comprising a TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> and BaO, wherein the TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> and BaO is an O<sub>2</sub> removal catalyst and wherein the TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> and BaO is a COS conversion catalyst.

However, Herrington et al discloses the use of metal compounds from Group 2a which includes barium (see column 3, lines 26-55).

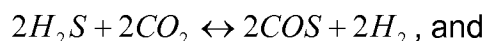
Tung et al disclose that TiO<sub>2</sub>, Cr<sub>2</sub>O<sub>3</sub>, and BaO an oxygen-scavenging elements (see paragraph 0029).

It would have been obvious to choose the reactor comprising a TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> and BaO, wherein the TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> and BaO is an O<sub>2</sub> removal catalyst and wherein the TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> and BaO is a COS conversion catalyst from a finite number of identified, predictable solutions for oxygen removal catalyst (or oxygen-scavenging elements), i.e., to would have been "obvious to try" the specific structure of the reactor comprising a TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> and BaO, wherein the TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> and BaO is an O<sub>2</sub> removal catalyst and

wherein the  $\text{TiO}_2$  catalyst carrying  $\text{Cr}_2\text{O}_3$  and  $\text{BaO}$  is a COS conversion catalyst to enhance reaction with molecular oxygen.

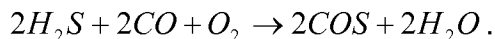
Claims 5, 8, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Herrington et al (US 4,618,723) and Tung et al (US 2003/0027912 A1) in view of Wachs (US 6,497,855 B1) and Borsboom et al (US 4,981,661).

Regarding claim 5, Herrington et al discloses a COS treatment method for a gasified gas containing  $\text{H}_2\text{S}$  and  $\text{CO}$ , the method comprising: increasing an initial concentration of COS in the gas and decreasing concentration of  $\text{H}_2\text{S}$ ,  $\text{CO}$  and  $\text{O}_2$  in the gas by using an  $\text{O}_2$  removal catalyst comprising of  $\text{TiO}_2$  and  $\text{Cr}_2\text{O}_3$  or comprising of  $\text{TiO}_2$  and  $\text{NiO}$  at a gas temperature of at least  $300^\circ\text{C}$  to accelerate the following reaction:



after the increasing of the initial concentration of COS in the gas and the decreasing of the concentration of  $\text{H}_2\text{S}$ ,  $\text{CO}$  and  $\text{O}_2$  in the gas, decreasing the increased concentration of COS in the gas to a concentration lower than the initial concentration of COS in the gas by converting COS contained in the gas to  $\text{H}_2\text{S}$  by using a COS conversion catalyst (see column 3, line 26 through column 4, line 45 and figure 1).

Herrington does not disclose a COS treatment method for a gasified gas containing COS,  $\text{H}_2\text{S}$ ,  $\text{H}_2\text{O}$ ,  $\text{O}_2$ , and  $\text{CO}$ , the method comprising: increasing an initial concentration of COS in the gas and decreasing concentration of  $\text{H}_2\text{S}$ ,  $\text{CO}$  and  $\text{O}_2$  in the gas by using an  $\text{O}_2$  removal catalyst consisting of  $\text{TiO}_2$  and  $\text{Cr}_2\text{O}_3$  or consisting of  $\text{TiO}_2$  and  $\text{NiO}$  at a gas temperature of at least  $300^\circ\text{C}$  to accelerate the following reaction:



Tung et al disclose that  $TiO_2$ ,  $Cr_2O_3$ , and NiO an oxygen-scavenging elements (see paragraph 0029).

It would have been obvious to choose the  $O_2$  removal catalyst consisting of  $TiO_2$  and  $Cr_2O_3$  or consisting of  $TiO_2$  and NiO from a finite number of identified, predictable solutions for oxygen removal catalyst (or oxygen-scavenging elements, i.e., to would have been "obvious to try" the specific structure of the  $O_2$  removal catalyst consisting of  $TiO_2$  and  $Cr_2O_3$  or consisting of  $TiO_2$  and NiO to enhance reaction with molecular oxygen.

Wachs discloses that carbonyl sulfide (COS) is found in many industrial process streams such as coal gasification (see column 1, lines 27-44) and the reaction of carbon monoxide with hydrogen sulfide forms carbonyl sulfide (see column 5, line 59 through column 6, line 25).

Borsboom et al discloses the gas from a coal gasification process commonly contains hydrogen sulfide, carbon monoxide, and sometimes also oxygen (see column 1, lines 12-19).

It would have been obvious to choose a gasified gas containing COS,  $H_2S$ ,  $H_2O$ ,  $O_2$ , and CO and an  $O_2$  removal catalyst consisting of  $TiO_2$  and  $Cr_2O_3$  or consisting of  $TiO_2$  and NiO at a gas temperature of at least  $300^\circ C$  to accelerate the following reaction:

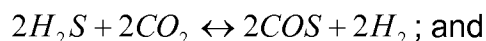
$2H_2S + 2CO + O_2 \rightarrow 2COS + 2H_2O$  from a finite number of identified, predictable solutions for catalytically converting COS without expensive waste of valuable hydrogen



and reducing the production of carbon dioxide, which is considered to be an environmental threat, i.e., it would have been "obvious to try" the specific compositions of the feed and O<sub>2</sub> removal catalyst to catalytically converted COS without expensive waste of valuable hydrogen and reducing the production of carbon dioxide, which is considered to be an environmental threat.

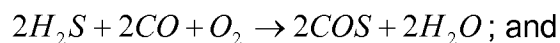
Regarding claim 8, Herrington et al discloses a COS treatment method wherein said O<sub>2</sub> removal catalyst is located in a higher-temperature region with respect to said COS conversion catalyst (see column 3, line 26 through column 4, line 9).

Regarding claim 10, Herrington et al discloses a COS treatment method for a gasified gas containing H<sub>2</sub>S and CO, the method comprising: removing O<sub>2</sub> from the gas by using a TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> to accelerate the following reaction:



simultaneously converting COS to H<sub>2</sub>S by using the TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> (see column 3, line 26 through column 4, line 45 and figure 1).

Herrington does not disclose a COS treatment method for a gasified gas containing COS, H<sub>2</sub>S, H<sub>2</sub>O, O<sub>2</sub>, and CO, the method comprising: removing O<sub>2</sub> from the gas by using a TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> and BaO to accelerate the following reaction:



simultaneously converting COS to H<sub>2</sub>S by using the TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> and BaO.

However, Herrington et al discloses the use of metal compounds from Group 2a which includes barium (see column 3, lines 26-55).

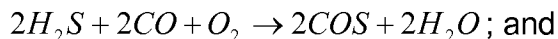
Tung et al disclose that  $\text{TiO}_2$ ,  $\text{Cr}_2\text{O}_3$ , and  $\text{BaO}$  are oxygen-scavenging elements (see paragraph 0029).

It would have been obvious to choose removing  $\text{O}_2$  from the gas by using a  $\text{TiO}_2$  catalyst carrying  $\text{Cr}_2\text{O}_3$  and  $\text{BaO}$  from a finite number of identified, predictable solutions for oxygen removal catalyst (or oxygen-scavenging elements), i.e., to would have been "obvious to try" the specific structure of the reactor comprising a  $\text{TiO}_2$  catalyst carrying  $\text{Cr}_2\text{O}_3$  and  $\text{BaO}$ , wherein the  $\text{TiO}_2$  catalyst carrying  $\text{Cr}_2\text{O}_3$  and  $\text{BaO}$  is an  $\text{O}_2$  removal catalyst and wherein the  $\text{TiO}_2$  catalyst carrying  $\text{Cr}_2\text{O}_3$  and  $\text{BaO}$  is a COS conversion catalyst to enhance reaction with molecular oxygen.

Wachs discloses that carbonyl sulfide (COS) is found in many industrial process streams such as coal gasification (see column 1, lines 27-44) and the reaction of carbon monoxide with hydrogen sulfide to form carbonyl sulfide by using the  $\text{TiO}_2$  catalyst carrying  $\text{Cr}_2\text{O}_3$  (see column 3, lines 39-64 and column 5, line 59 through column 6, line 25).

Borsboom et al discloses the gas from a coal gasification process commonly contains hydrogen sulfide, carbon monoxide, and sometimes also oxygen (see column 1, lines 12-19).

It would have been obvious to choose a COS treatment method for a gasified gas containing COS,  $\text{H}_2\text{S}$ ,  $\text{H}_2\text{O}$ ,  $\text{O}_2$ , and  $\text{CO}$ , the method comprising: removing  $\text{O}_2$  from the gas by using a  $\text{TiO}_2$  catalyst carrying  $\text{Cr}_2\text{O}_3$  to accelerate the following reaction:



simultaneously converting COS to H<sub>2</sub>S by using the TiO<sub>2</sub> catalyst carrying Cr<sub>2</sub>O<sub>3</sub> for catalytically converting COS without expensive waste of valuable hydrogen and reducing the production of carbon dioxide, which is considered to be an environmental threat, i.e., it would have been "obvious to try" the specific compositions of the feed and O<sub>2</sub> removal catalyst to catalytically converted COS without expensive waste of valuable hydrogen and reducing the production of carbon dioxide, which is considered to be an environmental threat.

### ***Response to Arguments***

Applicant's arguments with respect to claims 1, 4-5, and 8-10 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. See Erickson (US 4,287,170).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATASHA YOUNG whose telephone number is 571-270-3163. The examiner can normally be reached on Mon-Thurs 7:30 am-6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Walter Griffin can be reached on 571-272-1447. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/N. Y./  
Examiner, Art Unit 1797

/Walter D. Griffin/  
Supervisory Patent Examiner, Art Unit 1797